

**The New York Times**

## Technology

### TECHNOLOGY: DIGITAL COMMERCE; 2 plans for watermarks, which can bind proof of authorship to electronic works.

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Published: August 07, 1995

WATERMARKS in paper stock, visible when held up to the light, have been used for centuries to thwart counterfeiters and help prove the authenticity of documents and currency. In recent years, some cable channels and networks, like Comedy Central and CNN, have been stamping their programs with a video version of the watermark.

These video watermarks, which appear in a corner of the television screen, identify the channel for browsing viewers and, cable executives hope, scare off a few video pirates.

So it is no surprise, as information becomes currency in the global economy, that so-called digital watermark technologies are beginning to appear. As with their paper and broadcast counterparts, the concept behind digital watermarks is to provide a secure means to certify the origin, ownership and authenticity of digital works. And by doing so, they can provide the first line of defense against piracy of digital media like music, photographs, film, words and video games.

Because making and distributing copies are tasks that computers and networks perform with ease, some people argue that it is impossible to protect digital media from counterfeiters. They say that today's intellectual property laws simply cannot be applied to digital works. On the other hand, most large media companies contend that despite the increased risk of theft, they can protect their assets with existing law and a little creative problem solving.

But even if today's copyright laws are rejected as irrelevant in a digital world, or if authors and publishers choose not to collect a dime for what they put on a disk or distribute over a network, there will still be a need to verify the authorship of digital works -- if only to give credit where it is due and to protect the creator from plagiarism.

Thus, digital watermarks are not intended to increase commerce on computer networks, or even to prevent copying. Instead, their inventors say that they simply bind proof of authorship and other identifying data so tightly to the work that attempts to erase or remove them will cause permanent damage and render any copy useless.

Two start-up software concerns -- the DICE Company in Palo Alto, Calif., and the Digimarc Corporation in Portland, Ore. -- have taken slightly different approaches to creating digital watermarking systems. Each has patents pending on its processes for inserting and locking the watermarks in a file. Each approach uses a variation of data-security technology that scatters identifying information in such a way that it cannot be reassembled without an electronic key to the code.

Digimarc, which was founded by Geoffrey Rhoads, an astrophysicist who wanted to copyright his digital photos of Jupiter, is looking for partners to build products around its many patents. DICE -- an acronym for Digital Information Commodities Exchange -- is about to release an early version of its watermarking system, called Argent, for use in the music industry.

Cane Records, an independent music label run by University of Miami students, is using Argent technology to embed watermarks in the master recordings of its latest compact disk, a compilation of South Florida bands that is scheduled for release at the end of August.

The idea, according to DICE's vice president of technology, Marc Cooperman, was to demonstrate that the technology is compatible with existing audio equipment and that it is possible to embed a digital watermark without affecting sound quality. Dan Warren, the audio engineer who mastered the Cane recording, indeed states emphatically there was "no degradation whatsoever" in sound quality after embedding the mark.

This particular watermark, scattered as data in a random pattern invisible to the CD playback unit, included the date the disk was manufactured, its universal product code, the artist, title, producer and engineer for each track, the copyright year and copyright authority (Cane Records, in this case) and how many CD's were pressed.

By itself, this information may have little use. But as a test, the Cane disk reveals how watermarks may make it possible for publishers to sell media on computer networks without ceding the battle to pirates.

In an on-line purchase, Mr. Cooperman said, a watermark could easily include the purchaser's name, authenticated at the time of purchase along with an identifying customer account number. Consumers as well as counterfeiters are likely to be more careful about copying what they buy if they know illegal copies can be traced to them.

So far, it is not possible with either the DICE or the Digimarc systems for a consumer to read the watermark on a piece of digital media.

Only the publisher or owner of the copyright holds the electronic key that makes the watermark readable. That may be useful to the copyright holder, but it does not help the person who wants to know if it is permissible to copy a particular work -- or from whom to receive or purchase such permission.

Digimarc's founder, Mr. Rhoads, said he was working on a method that would allow the embedded watermark, which people cannot read or alter, to co-exist with a public watermark that people can read.

Whether or not Digimarc or DICE develop their experimental technologies in large-scale systems for digital commerce, big media companies are already exploring the potential benefits of the digital watermark concept.

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Ed Horowitz, chairman of the interactive media unit of Viacom Inc., said he was intrigued by the potential.

Whether starving artist or media conglomerate, he said, "Our challenge as publishers is to decide whether the things we value, our pearls, are things we want to get paid for, or whether they are pearls we want everyone to have."

And the first obvious step is to establish who, in fact, owns those pearls. Though the technology for digital watermarks is still in early development, it may prove to be the cornerstone upon which an information economy is built.

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